

## PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 206903/kcs/dg	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. PCT/IB 2002/003644	International filing date (day/month/year) 06-09-2002	Priority date (day/month/year) ---
International Patent Classification (IPC) or national classification and IPC G01S5/02, G01S5/14, H04Q7/38		
Applicant NOKIA CORPORATION et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
  - a. ☒ (sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:
    - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

## 4. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

Date of submission of the demand  06-04-2004	Date of completion of this report  17-11-2004
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Form PCT/IPEA/409 (cover sheet) (January 2004)

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# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/IB 2004/003644

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))  
☐ publication of the international application (under Rule 12.4)  
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-86 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☒ the claims:

pages 88-92 as originally filed/furnished

pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19

pages\* 87, 93 received by this Authority on 2004-08-05

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☒ the drawings:

pages 1-12 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/IB 2004/003644

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-26</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-26</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-26</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

Documents cited in the International Search Report:

D1: US 6002936 A

D2: US 6112082 A

D3: EP 1030531 A1

D4: WO 0203093 A1

D1 discloses a method and a system for determining and selecting the optimum positioning method based on available positioning methods to provide a location estimate of a mobile device in a cellular communications network (see column 1, lines 9-14). Positioning methods can be timing advance, time of arrival, enhanced observed time difference or GPS (see column 4, lines 49-56).

D2 discloses determining virtual base station estimates by signal strength measurements (see column 9, line 14-52).

D3 discloses a method of combining, using a weighted sum, at least two estimated locations based on different location methods (see page 2, line 54- page 3, line 31 and abstract).

D4 discloses a system for position determination of a mobile terminal comprising a positioning method selection device (see abstract).

However, the claims have been amended. Independent claims 1 and 26 now describe that at least one of a plurality of location methods is selected, said methods comprising using cell identity information.

.../...

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

The cited documents represent the general state of the art.

The invention defined in amended claims 1-26 is not disclosed by any of these documents.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed method and system for estimating the position of a mobile device. Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-26 is novel and is considered to involve an inventive step. The invention is industrially applicable.

CLAIMS

1. A method of estimating the location of a mobile device, comprising the steps of:  
5       collecting location information;  
          selecting at least one of a plurality of different location methods to provide a location estimate said methods comprising using cell identity information; and  
          providing a location estimate based on the at least one selected location method.  
10
2. A method as claimed in claim 1 wherein said at least one location method comprises the following methods:  
          a method using cell identity information;  
          a method using cell identity information and received signal strength;  
15       a method using cell identity information and timing advance information; and  
          a method using cell identity information, received signal strength information and timing advance information.
3. A method as claimed in claim 1 or 2, comprising the step of determining a  
20   virtual base station estimate.
4. A method as claimed in claim 3 when appended to claim 2, wherein said virtual base station estimate is determined using at least one of the methods of claim 2.  
25
5. A method as claimed in claim 3 or 4, wherein said virtual base station location estimate coupled with at least one virtual measurement and at least one real measurement and said at least one virtual measurement is processed using a location method.

22. A method as claimed in any preceding claim, wherein a location estimate is provided using an algorithm solving the following equation in  $x$  and  $y$ :

$$\begin{cases} \sum_{i=1}^N \left[ -\frac{I_i}{|R|} (x - x^i) - \frac{(\tilde{I}_i - 1)}{|R|} \{ (x^i)^2 x - x^i y^i (y - y^i) \} \right] = 0 \\ \sum_{i=1}^N \left[ -\frac{I_i}{|R|} (y - y^i) - \frac{(\tilde{I}_i - 1)}{|R|} \{ (y^i)^2 y - x^i y^i (x - x^i) \} \right] = 0 \end{cases} ; (x, y) \in \mathcal{D}$$

23. A method as claimed in any preceding claim, wherein a location estimate is provided using an algorithm based on the following equation:

$$\hat{x} = \frac{\sum_{i=1}^N \frac{x^i}{\tilde{I}_{i0}}}{\sum_{i=1}^N \frac{1}{\tilde{I}_{i0}}} ; \hat{y} = \frac{\sum_{i=1}^N \frac{y^i}{\tilde{I}_{i0}}}{\sum_{i=1}^N \frac{1}{\tilde{I}_{i0}}} ; (\hat{x}, \hat{y}) \in \mathcal{D}$$

24. A method as claimed in any preceding claim, wherein said location estimate is provided by one of a iterative and a closed form method.

25. A method as claimed in any preceding claim, wherein said location estimate is provided by one of a linear and non linear method.

26. A system for estimating the location of a mobile device, comprising:  
means for collecting location information;  
means for selecting at least one of a plurality of different location methods to provide a location estimate said methods using cell identity information; and  
means for providing a location estimate based on the at least one selected location method, wherein said at least one location method comprises using cell identity.